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covered with trees and shrubbery; that tidal observations in the lagoon show no relation between the rise and fall inside the lagoon, and outside; that the weather, though mostly fine, is somewhat changeable, with occasional sudden showers; and that the climate of the island, though warm, is delightful, the surrounding sea conducing to an equable temperature.

Mr. Upton presents a very full paper, occupying nearly one-third of the volume, on the meteorology of the island during the period of two weeks extending from April 25 to May 9. Frequent observations were made with the ordinary meteorological instruments, and with special radiation apparatus furnished by the chief signal-officer. The meteorological bearings of the eclipse were carefully attended to, and the observations are fully discussed, and the results clearly presented in graphical form.

One section of the report was prepared by Professor Trelease, and relates to the botany of Caroline Island as represented by the collections of Dr. Dixon, U. S. navy, who contributes also a page or two of interesting notes on the zoölogy of the island. The lepidoptera received attention, and the valuable collection made by Dr. Palisa was taken to Vienna for identification. At Professor Holden's request, however, he very kindly made and presented to the American expedition as complete a collection of duplicates as was possible; and these are reported upon by Mr. Butler of the British museum, and Mr. Strecker of Pennsylvania.

Coming now to the physical and astronomical results of the expedition, we find first a condensed statement of Professor Holden's plan of operations on the day of the eclipse, followed by the reports of all the observers on the special fields of work assigned to them. During the period of totality, Professor Holden devoted his own attention to the search for intra-mercurial planets, with the negative result long since known, and which he regards as conclusive to such an extent that "at future eclipses it will not be necessary to devote an observer and a telescope to the further prosecution of this search." Dr. Hastings, with an unusual equipment for polariscopic and spectroscopic work, gave his entire time to the solar corona. He found that with delicate methods the brighter portions of the corona ought to be observable more than a minute before totality. Dr. Hastings presents his own observations, and concludes that "the enormous change in the extent to which the 1474 line could be traced east and west of

the sun, with very slight change of the moon's place, precludes the explanation hitherto accepted of a gaseous atmosphere extending as far as implied by the spectroscope." Regarding these results, then, as strongly indicating the need of a different explanation of the observed phenomena, he institutes a thorough review of the results of all the observations of the corona at previous eclipses, and groups them under the head of spectroscopic analysis, polarization, and photography. The hitherto accepted explanation of the phenomena is then briefly set forth; and following it his own explanation is proposed, which is, that the coronal phenomena may be fully accounted for by applying the well-known principles of diffraction to the sunlight which grazes the edge of the lunar disk, and is propagated to the eye of the observer.

THE PHYSICAL FEATURES OF BRAZIL.¹

THE greater part of the empire consists of an elevated plateau, having the mean elevation of from 300 to 1,000 metres, limited on the north and west by the great continental depressions of the Amazonas and Paraguay basins, which are almost united through the valley of the Madeira, and its tributary the Guaporé. A portion of the elevated plateau of Guiana, nearly the whole of the great Amazonian depression, and the upper part of that of the Paraguay, are also included in the empire. In addition to these four grand natural physical divisions, there is also an Atlantic border-region, forming a narrow strip between the ocean and the eastern margin of the great continental plateau.

Although generally represented as wholly mountainous, the Brazilian plateau consists in great part of tablelands, which, from the deep excavation of the innumerable river-valleys, have become very much accidented, so as to present a mountainous aspect. The true mountains (restricting the term to the elevations formed by upheaved strata) are mainly in the eastern and central portions, and may be considered as constituting two groups, nearly separated by the elevated tablelands of the Paraná and São Francisco basins.

The eastern or maritime group accompanies the coast of the Atlantic at a short distance from the sea, from near the north-east shoulder of the continent at Cape São Roque, to or near the southern limits of the empire. The central or Goyaz group occupies a part of the southern portion of the province of Goyaz, and that part of the province of Minas Geraes lying to the west of the São Francisco, and is joined to the eastern group by a transverse ridge extending in the direction east-west, across the southern portion of the province of Minas Geraes. This transverse ridge, with the mountains of Goyaz, forms part of the great east and west watershed of the con-

¹ From the *Rio News*.

tinent, which is generally known as the Serra das Vertentes, — an improper designation, since a considerable portion of the watershed is not, properly speaking, mountainous.

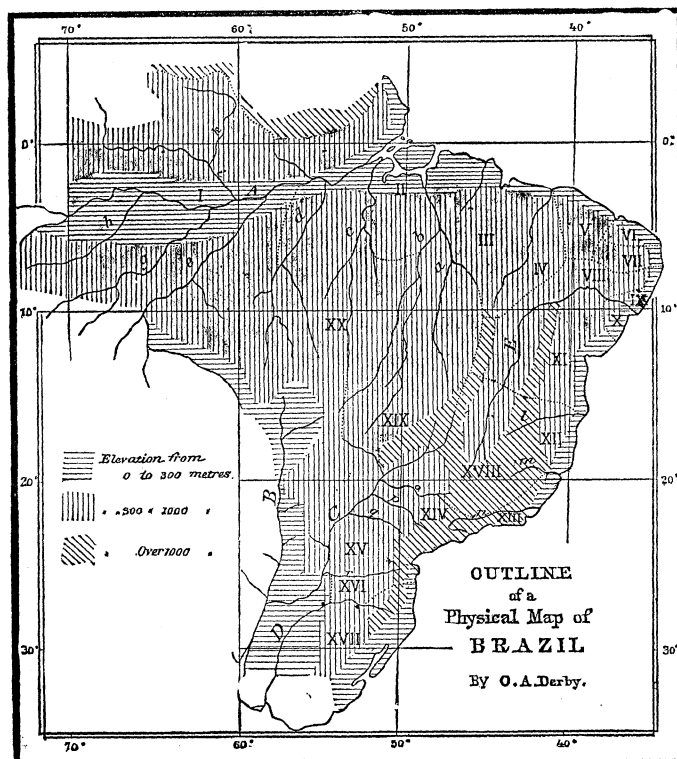
The mountains of the eastern group form a long and comparatively narrow zone of about sixty miles in maximum width in the provinces south of Rio de

Serra da Mantiqueira, at the angle of the three provinces of Rio de Janeiro, São Paulo, and Minas Geraes, with 2,712 metres of elevation above the level of the sea; this last being the highest point of the empire. Somewhat to the north of Rio de Janeiro the culminating line of the group passes from the Serra da Mantiqueira, which continues in a

north-easterly direction, to a branch, which, under the name of Serra do Espinhaço, extends north, or a little east of north, along the eastern margin of the São Francisco basin. The highest points of this range are the peaks of Itacolumi (1,752 metres) and Caraça (1,955 metres), near Ouro Preto; the peak of Piedade, near Sabará (1,783 metres); and Itambé, near Diamantina (1,823 metres). The mountains of this group become lower in the provinces north and south of those above indicated, and to the northward of the São Francisco are represented by short detached ranges and isolated peaks.

The western mountain group consists of at least two distinct ranges, — that of the Serra da Canastra, or Matta da Corda, extending in a general northerly direction from the head waters of the São Francisco to the southern rim of the basin of its great western tributary the Paracatu; and the mountains of southern Goyaz, extending in a north-easterly direction between the heads of the Tocantins, Araguaya, and Paraná basins. The first is an offset from a broad expansion of the Mantiqueira Range, which, in southern Minas Geraes and northern São Paulo, extends westward to, and somewhat beyond, the head of the São Francisco. Its culminating point is the Serra da Canastra, at the source of the São Francisco, which rises 1,282 metres above the sea. The limits and extension of the Goyaz chain cannot be definitely traced, as the accounts of the geology of the region are too meagre to enable one to discriminate between the true mountains of upheaval and the ridges produced by denudation from horizontal strata. It is thus impossible, at present, to state how great a part of the various watersheds radiating from the Goyaz Mountains as a centre should be classed with them, or whether any of these ridges constitute, or not, a distinct system. The culminating point of the system is the Montes Pyreneos, near the city of Goyaz, whose height is variously estimated at from 2,310 to 2,932 metres, the former being probably nearest the truth.

The great tablelands (composed of horizontal or



RIVERS.

- A. Amazonas.
- B. Paraguay.
- C. Paraná.
- D. Uruguay.
- E. São Francisco.
- F. Parahyba.
- a. Tocantins.
- b. Araguaya.
- c. Xingú.
- d. Tapajox.
- e. Madeira.
- f. Guaporé.
- g. Purús.
- h. Juruá.
- i. Javary.
- j. Negro.
- k. Branco.
- l. Jequitinhonha.
- m. Doce.
- n. Parahyba.
- o. Rio Grande.
- p. Tietê.
- q. Parapanema.
- r. Iguassú.

PROVINCES.

- I. Amazonas.
- II. Pará.
- III. Maranhão.
- IV. Piauí.
- V. Ceará.
- VI. Rio Grande do Norte.
- VII. Parahyba.
- VIII. Pernambuco.
- IX. Alagoas.
- X. Sergipe.
- XI. Bahia.
- XII. Espírito Santo.
- XIII. Rio de Janeiro.
- XIV. São Paulo.
- XV. Paraná.
- XVI. Santa Catharina.
- XVII. Rio Grande do Sul.
- XVIII. Minas Geraes.
- XIX. Goyaz.
- XX. Matto Grosso.

Janeiro, which widens to four or five times that width in the southern part of the province of Minas Geraes, but becomes reduced to a width of from 150 to 200 miles in the region to the east of the São Francisco. In the provinces of Paraná, São Paulo, Rio de Janeiro, Espírito-Santo, and the south-eastern part of the province of Minas Geraes, where this group attains its greatest development, there are two well-defined parallel ranges, the Serra do Mar and the Serra da Mantiqueira, which extend from south-west to north-east. The culminating points are the peaks of the Organ Mountains, in the Serra do Mar, at the head of Rio Bay, 2,232 metres high; and Itatiaia, in the

nearly horizontal strata) of the Brazilian plateau are those of the Paraná, Amazonas, São Francisco, and Parnahyba basins. That of the Paraná basin, which may be considered as embracing the Uruguay, includes a large portion of the provinces of Rio Grande do Sul, Santa Catharina, Paraná, and São Paulo; a small part of south-western Minas Geraes and southern Goyaz; and the elevated portion of the province of Matto Grosso, and of the republic of Paraguay, lying between the Paraná and Paraguay. The maximum elevation along the eastern border in the provinces of Paraná and São Paulo is approximately 1,000 metres, the general level becoming a few hundred metres lower to the southward and westward, as the result not only of denudation, but also of a general lowering of the surface.

The Amazonian tableland includes the greater part of the provinces of Matto Grosso and Goyaz, a large part of southern Pará, and relatively small portions of south-eastern Amazonas and western Maranhão. It is drained by the Tocantins-Araguaya, Xingú, Tapajós, and lower Madeira, with its tributary the Guaporé, all of which descend from the tableland in a series of rapids, at a distance of from 100 to 200 miles from the Amazonas. The southern margin of this great tableland—an escarpment rising to between 800 and 1,000 metres above the level of the sea, and facing the depression of the Paraguay and Guaporé—has received the name of Serra dos Parecis.

The São Francisco tableland lies mainly to the west of that river, in the western part of the provinces of Minas Geraes and Bahia, and rises to the height of about 800 metres. It is doubtful whether or not it extends over the watershed, so as to be continuous with those of the Tocantins and Parnahyba valleys. The latter occupies all, or nearly all, of the province of Piahy, and a portion of southern Maranhão and western Ceará, and is perhaps continuous with the Amazonian tableland along the Tocantins divide.

All of these tablelands are deeply cut by numerous river-valleys so as to present almost everywhere a mountainous aspect; and the ridges formed by denudation are generally spoken of as mountains, and are represented as such on all maps of the empire.

The Brazilian portion of the Guiana plateau is very imperfectly known. Along the watershed between the Amazonas and the rivers flowing to the Caribbean Sea there are mountains whose culminating points are said to rise to the elevation of 2,000 metres or more; and spurs of high lands extend to within a few miles of the Amazonas at several points between the mouth of the Rio Negro and the sea. This region is drained by the Rio Negro, with its tributary the Rio Branco, and a number of smaller rivers, among which the Jamundá, Trombetas, Parú, Jary, and Araguay are the most important.

The great Amazonian depression is relatively narrow along the lower river, below the mouth of the Rio Negro, the average width being probably between 100 and 200 miles. Above the Rio Negro and Madeira,

in the province of Amazonas, it widens considerably, so that it presents a bottle or flask shape. The river is generally bordered by low alluvial plains, often of considerable width, which are subject to overflow, and are full of lakes and anastomosing side-channels of the great river, or of the lower courses of its tributaries. The higher lands are either tablelands less than 300 metres in height, formed by deposits peculiar to the depression, or denuded outliers of the margins of the great continental plateaus on either side, or of the Andean plateau at the head of the basin.

The Brazilian part of the Paraguay depression is the upper portion of the immense plains of the basin of that river, which form a large part of the Argentine Republic, Paraguay, and eastern Bolivia. These plains lie several hundred metres lower than the lands of the plateau that encircle them, and of its numerous spurs and outliers. They are, for the most part, but slightly elevated above the level of the rivers (the upper Paraguay and its tributaries) that traverse them, and, during the wet season, become transformed into immense lakes and marshes.

The Atlantic border-region consists of a zone, generally only a few miles in width, lying between the coast and the margin of the continental plateau. South of Rio de Janeiro it is constituted by low sand-plains full of lagoons, and by denuded spurs and outliers of the plateau. North of Rio de Janeiro there are in many places, in addition to these, hills and tablelands of formations peculiar to this coast-belt, which rise to a height of from 100 to 200 metres.

O. A. DERBY.

THE LAST CRUISE OF THE ALBATROSS IN THE GULF OF MEXICO.

ACCORDING to a late report by Lieut.-Commander Z. L. Tanner, U.S.N., commanding the U. S. fish-commission steamer Albatross, dated at New Orleans, Feb. 13, the recent short cruise of that vessel has been productive of some interesting results.

The Albatross left Washington on the afternoon of the day before Christmas (1884), and after some delay by ice in the river, and by rough weather in Chesapeake Bay, arrived at Norfolk on the morning of the 26th. Having taken in coal at Norfolk, and received the party of naturalists detailed for the cruise,¹ she put to sea on the afternoon of Jan. 3 (1885), bound for Key West. At starting, the very unusually high barometer of 31.10 was noted; but the glass began falling early next morning, with the setting-in of a smart south-east gale and heavy sea. On the 6th, the weather having moderated, a trawl-line was set for tile-fish, in 79 fathoms, off the Carolina coast, but without result. Four hauls with the beam-trawl, with wing-nets and mud-bags, in about the same locality, were more productive, bringing up many familiar species, and some new to the ship.

¹ Mr. J. E. Benedict (in charge), Capt. J. W. Collins, Dr. Tarleton H. Bean, and Mr. Thomas Lee.